

REMARKS

I. GENERAL

Claims 1-39 stand rejected under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim what applicants regard as the invention. Claims 1-19, 30-35 and 37-39 stand rejected as obvious over U.S. Patent No. 4,837,682 to Culler (hereinafter "the Culler patent") in view of U.S. Patent No. 5,168,547 to Miller et al (hereinafter "the Miller patent") and U.S. Patent No. 4,991,084 to Rodiger et al (hereinafter "the Rodiger patent"). The Examiner has not asserted a prior art rejection of claims 20-29, or 36.

II. THE 35 U.S.C. § 112, ¶ 2 REJECTIONS

In response to the Examiner's comments, applicants have amended claims 1, 30, and 33 in order to more particularly point out and distinctly claim what applicants regard as their invention. Applicants have not, however, amended claim 1 with regard to the phrase "a plurality of bus elements, with each of the plurality of bus elements selectively making a request for access to at least one other bus element." The Examiner states that this phrase is vague and indefinite because "it is unclear as to how the plurality of bus elements makes one request." Applicants respectfully submit that the plurality of bus elements do not collectively make one request for access to another bus element. Rather, the plurality of bus elements according to the present invention are each able to request

access to another bus element with the arbitration logic determining which bus element is granted access through the central unit to another bus element.¹

In light of these amendments and clarification, applicants respectfully submit that the Examiner's rejection is traversed and should be withdrawn. Since claims 2-29, 31-32, and 34-39 were rejected based upon their dependence from claims 1, 30, and 33, withdrawal of the Examiner's rejection of these claims is also respectfully requested.

III. THE 35 U.S.C. § 103 REJECTIONS

A. The Examiner's Rejections

After carefully reviewing the Examiner's contentions in the pending Office Action, applicants respectfully submit that the Culler, Miller and Rodiger patents are insufficient to render any of claims 1-19, 30-35 and 37-39 obvious.

The Examiner states the following in support of his obviousness rejection as applied to claim 1:

As per claim 1, Culler teaches the claimed:

'a plurality of bus elements': Culler's plurality of bus elements (See Fig. 6, elements 508, 544, 548, 522 and 528);

'a central unit having a plurality of bus inputs and an output': Culler's central unit having a plurality of bus inputs and a plurality of bus outputs (See Fig. 5, element 600);

'arbitration logic connected to

¹ See, e.g., Application p. 9, line 12 to p. 10, line 10.

the plurality of bus inputs of the central unit ... for granting each of the bus elements access to the at least one other bus element': Culler's arbitration logic connected to the plurality of bus inputs of the central unit ... for granting each of the bus elements access to the at least one other bus element (See col. 8, lines 36-42).

While the Examiner admits that "Culler fails to expressly teach the limitations of 'a first plurality of uni-directional point-to-point buses ... and a second plurality of uni-directional point-to-point buses ...'" as well as "point-to-point coupling of a particular one of the plurality of bus elements with the at least one other bus element," the Examiner nevertheless asserts that it would be obvious to provide such features in the Culler system, combined a claimed, as evidenced by the Miller and Rodiger patents.

Independent claims 30 and 33 have been rejected on the same grounds as claim 1.

B. The Legal Standard

When evaluating a claim under Section 103, the prior art references must be evaluated as a whole for what they fairly teach and neither the references' general nor specific teachings may be ignored. See Application of Lunsford, 357 F.2d 385, 389-90 (CCPA 1966). Thus, any reference must be considered for all that it teaches, not only what purportedly points toward the invention but also that which teaches away from the invention. Ashland Oil, Inc. v. Delta Resins & Refractories, 776 F.2d 281, 296

(Fed. Cir. 1985).

In order for a claim to be obvious over a combination of prior art references, the prior art must not only disclose each element of the claim, but must provide "some teaching, suggestion, or incentive to make the combination made by the inventor." Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed.Cir.), cert. denied 111 S.Ct. 296 (1990); see also In re Bond, 910 F.2d 831, 834 (Fed.Cir. 1990). Further, a person of ordinary skill in the art must find that the cited combination, in and of itself, without the benefit of the invention under consideration, must render the invention as a whole obvious. Application of Sponnoble, 405 F.2d 578, 585 (C.C.P.A. 1969). Moreover, "care must be taken to avoid hindsight reconstruction by using 'the patent in suit as a guide through the maze of prior art references in the right way so as to achieve the result of the claims in suit.'" Grain Processing Corp. v. American Maize-Prods. Co., 840 F.2d 902, 907 (Fed. Cir. 1988) (citing Orthopedic Equip. Co. v. United States, 702 F.2d 1005, 1012 (Fed. Cir. 1983)).

C. The Examiner's Obvious Rejection is Improper and Should be Withdrawn

As set forth in the specification of the present invention, conventional bus systems utilize multi-drop buses.² In accordance with such systems, a plurality of bus elements are coupled to a single bus and an arbitration

² See Application, p. 1, lines 11-16.

method is used to determine which bus element has control of the bus at a particular time. One problem with such systems is that all the bus elements are always coupled directly to the bus, thereby allowing each bus element to see what is being transmitted on the bus but also inhibiting the processing speed at which the elements coupled to the bus can operate.³

As stated on page 2, line 27 et seq. of the present application:

[t]he high speed bus system of the present invention provides much of the functionality familiar from conventional multi-drop buses, such as common visibility of each transaction by all CPU's, but with the speed and signal quality advantages of unidirectional point-to-point buses.

The Culler patent describes a multi-drop bus system. As stated in the "Summary of the Invention" of the Culler patent, "[a] system bus interconnects the processor units and local memories in parallel to the local bus."⁴ Thus, the Culler patent describes a bus system in which each processor unit is connected through a local bus to its associated local memory while a common system bus provides a common connection among all processor units and all local memories, the system bus being in parallel to the local bus.⁵ Accordingly, all of the processor units and memories in the Culler patent are coupled directly to the system bus. To control the flow of data over the system bus, the

³ See Application, p. 2, line 1 to p. 3, line 12.

⁴ Culler patent, col. 1, lines 57-59.

⁵ Id.

Culler patent purports to provide a Central Bus Arbitration and logic means which grants control of the system bus to a requesting one of the processor units. Therefore, the Culler patent is precisely the type of multi-drop prior art system which the present invention was designed to improve upon.

The bus system arbitration method described by Culler provides that if a processor unit is denied access to the system bus and there is no conflict in requesting the processor unit's associated local memory, a request is granted for the requesting processor to access its associated local memory over its local bus during the clock cycle instead of using the system bus.⁶ Such use of the local bus instead of the system bus is described in Culler as the

situation where the bus arbitration method and apparatus of the present invention are utilized for performing arbitration of the various priorities among units requesting use of the system bus.⁷

In contrast, according to the present invention, a central unit includes a plurality of inputs and a plurality of outputs with a plurality of bus elements to be coupled to the central unit.⁸ The bus elements are coupled to the central unit via unidirectional buses.⁹ The central

⁶ Culler patent, col. 2, lines 16-24; col. 7, lines 8-44.

⁷ Id. at col. 7, lines 41-44.

⁸ Application at p. 6, line 21 to p. 8, line 20.

⁹ Id.

unit operates to selectively couple a unidirectional bus from one of the bus elements through the central unit to a unidirectional bus of another of the plurality of bus elements. Thus, in accordance with the present invention, only the bus element which has been selected by the central unit is coupled directly to the other bus element through the central unit. As demonstrated above, the Culler patent relates to a multi-drop bus system which is predicated on the coupling of all bus elements directly to a common, system bus. Thus, the Culler system at least fails to show or suggest a first or second plurality of unidirectional buses as recited in elements (c) and (d) of claim 1. Further, Culler does not show a central unit which provides "point-to-point coupling of a particular one of the plurality of bus elements with the at least one other bus element" as recited in element (b) of claim 1. Finally, the Culler patent utterly fails to disclose arbitration logic which "grants each of the bus elements access to the at least one other bus element through the central unit one at a time based upon the requests from the bus elements." (emphasis added).

Therefore, unless the Examiner's secondary and tertiary references, the Miller patent and the Rodiger patent, respectively, at least disclose a first and second plurality of unidirectional buses and arbitration logic and a central unit, configured as recited in claim 1, and suggest combining these features with the features of the Culler patent to create the present invention as claimed,

the Examiner's rejection should be withdrawn.

In an attempt to cure the admitted deficiencies of the Culler patent, the Examiner asserts that the Miller patent shows unidirectional buses and that it would be obvious to combine Miller and Culler to improve the efficiency of high speed processing of the Culler patent. The Examiner does not assert that the Miller patent shows or suggests a central unit, arbitration logic, and a first and second plurality of unidirectional buses configured as claimed. Instead, the Examiner merely asserts that the "limitations of 'a first plurality of uni-directional buses ... and a second plurality of uni-directional point to point buses ...' is [sic] well known to one of ordinary skill in the art," without pointing to any language in either Culler or Miller which would lead one of ordinary skill in the art, without the benefit of applicants disclosure, to combine these references to create the present invention.

As respectfully submitted by Applicants in response to the Examiner's rejection contained in the Office Action dated July 2, 1993, Applicants reassert that they do not contend that the concept of a unidirectional bus is novel. Rather, applicants contend that the use of a first and second unidirectional bus in combination with a central unit and arbitration logic, configured as claimed, is unobvious over the prior art. Applicants respectfully resubmit that one of ordinary skill in the art would not be led to insert the alleged unidirectional point-to-point

buses of the Miller patent into the system of the Culler patent because the entire Culler system is predicated on the use of a single, common, system bus coupled to all bus elements and respective local buses coupled between each bus element and its local memory. Moreover, the Examiner's assertion of the Miller patent does not address the Culler patent's failure to disclose or suggest a central unit as claimed or arbitration logic which "grants each of the bus elements access to the at least one other bus element through the central unit one at a time based upon the requests from the bus elements" as claimed.

The Examiner has asserted the Rodiger patent to cure the Culler and Miller patents' admitted failure to disclose or suggest "point-to-point coupling of a particular one of the plurality of bus elements with the other bus element."¹⁰ Applicants respectfully submit, however, that the use of a first and second unidirectional bus in combination with a central unit and arbitration logic providing point-to-point coupling between bus elements, configured as claimed, is unobvious over the prior art. Indeed, the Examiner does not assert that the Rodiger patent shows or suggests a central unit, arbitration logic, and a first and second plurality of unidirectional buses configured as claimed. The Examiner merely asserts that the existence of point-to-point coupling in the prior art, as purportedly evidenced by the Rodiger patent, provides a suggestion to create the present

¹⁰ Office Action, at p. 4.

invention. Once again, however, one of ordinary skill in the art would not be led to insert the alleged unidirectional point-to-point buses of the Miller patent and the alleged point-to-point coupling of the Rodiger patent into the system of the Culler patent because the entire Culler system is predicated on the use of a single, common, system bus coupled to all bus elements and respective local buses coupled between each bus element and its local memory. Such a system is simply inconsistent with the use of unidirectional point-to-point buses and point-to-point coupling as recited in claim 1. Moreover, the Rodiger patent fails to cure the Culler and Miller patents' failure to disclose or suggest a central unit as claimed or arbitration logic as claimed.

Moreover, as explained below, the Rodiger and Miller patents not only fail to provide any suggestion for a combination with the Culler patent, but moreover, any purported combination of the Culler, Miller, and Rodiger patents would not result in the present invention.

Applicants respectfully submit that when the Culler, Miller and Rodiger patents are objectively viewed, both for what they do and do not teach, it is clear that one of ordinary skill in the art at the time of applicants invention would not find it obvious to combine these references to create a device which provides the familiar functionality of a multi-drop bus system while eliminating the inherent disadvantages of such a system by utilizing point-to-point connections between bus elements as recited

in claim 1.

Moreover, assuming arguendo that there was a suggestion in the prior art to combine the Miller patent's purported unidirectional bus into the Culler patent bus arbitration system and method, the resulting combination would not teach the present invention. As asserted by the Examiner, the Miller patent purports to teach the use of unidirectional point-to-point buses. Substituting such buses into the system according to the Culler patent would result, at most, in the connection of the processor units of the Culler system to their respective local memories over unidirectional local buses. The use of such unidirectional buses, however, would not affect the basic operation of the Culler arbitration system: direct coupling of bus elements to common system bus and either granting a processor unit control of the common system bus or granting the processor unit access to its associated memory over its local bus if the processor cannot access the system bus.¹¹ Such a system would, for example, fail to disclose at least 1) a central unit which "selectively [couples] at least one of the inputs to at least one of the outputs" and 2) arbitration logic "for granting each of the bus elements access to the at least one other bus element through the central unit" (emphasis added), and 3) point to

¹¹ See Culler patent, col. 2, lines 16-23; col. 3, lines 13-21, lines 43-50.

point coupling.¹² Such a system would also fail to disclose "the first and second plurality of uni-directional buses" as claimed because substitution of unidirectional buses for the local bus of the Culler patent would not result in said unidirectional buses being coupled to the purported "Central Unit" of Culler in view of the fact that the purported "Central Unit" of Culler is not connected to the local bus.¹³

As such, the incorporation of the Miller patent's purported unidirectional point-to-point buses into the Culler patent would not result in a bus system as recited in claim 1.

With regard to the Examiner's assertion of the Rodiger patent, even assuming arguendo that there was a suggestion in the prior art to combine the Rodiger patent's purported arbitrating switching matrix system and the purported unidirectional buses of the Miller patent into the Culler patent's central bus arbitration system, the resulting combination would not teach the present invention. The Examiner admits that both Culler and Miller fail to teach "point-to-point coupling of a particular one

¹² The Examiner admits that the combination of the Culler and Miller patents fails to disclose or suggest "point to point coupling of a particular one of the plurality of bus elements with one other bus element," Office Action, p. 4, and has proffered the Rodiger patent in an attempt to cure this deficiency. Applicants will address the Examiner's assertion of Rodiger in more detail below.

¹³ Moreover, substitution of unidirectional buses for the common system bus of Culler would result in an inoperable device because of the failure of the Culler device to disclose or suggest the central unit or arbitration unit as described above.

of the plurality of bus elements with one other bus element," but asserts that the Rodiger patent describes such a feature. The use of point-to-point coupling of bus elements in the Culler system, however, would at most allow the Culler system to select a single processor unit to receive access to the system bus to connect to a particular other processor unit or memory. Such use of point-to-point coupling would not affect the basic operation of the Culler arbitration system as described in the patent: either direct coupling of bus elements to a common system bus and granting a processor unit control of the common bus or granting the processor unit access to its associated memory over its local bus if the processor cannot access the system bus.¹⁴ Accordingly, additional incorporation of the purported point-to-point coupling of the Rodiger patent into the system of the Culler patent would not cure the deficiencies described above with regard to the central unit and arbitration logic.

Applicants respectfully submit that when the Culler, Miller and Rodiger patents are objectively viewed, both for what they do and do not teach, it is clear that one of ordinary skill in the art at the time of applicants' invention would not find it obvious to combine these references to create the present invention.

Withdrawal of the Examiner's rejection of claim 1 is therefore respectfully requested.

¹⁴ See Culler, col. 2, lines 16-23; col. 3, lines 13-21, lines 43-50.

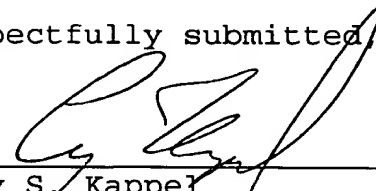
Claim 30 similarly recites a central unit, arbitration logic, a plurality of first and second unidirectional point to point buses, and first and second unidirectional memory buses. Claim 33 is a method claim which recites a plurality of first and second unidirectional buses, a central unit, and arbitration means. As a result, the remarks made above with regard to claim 1 apply with equal force to claims 30 and 33 and withdrawal of the Examiner's rejection of claims 30 and 33 is also respectfully requested.

Claims 2-29, 31-32, and 34-39 depend from and incorporate the limitations of claims 1, 30, and 33. Withdrawal of the Examiner's rejection of claims 2-19, 30-35, and 37-39 is therefore respectfully requested.

IV. CONCLUSION

The present invention is new, non-obvious, and useful. Reconsideration and allowance of claims 1-39 is requested.

Respectfully submitted,



Cary S. Kappel
Registration No. 36,561
Attorney for Applicants
c/o KENYON & KENYON
One Broadway
New York, New York 10004
Telephone: (212) 425-7200